

REMARKS

Applicants thanks Examiner Tentoni for discussing the application and pending rejections on Aug. 15. The comments and suggestions provided are appreciated.

Claims 1-4, 6 – 10, 12 – 15, 17, 19, 23 – 25 and 34 are currently pending. Claim 22 is canceled and claims 1, 9, and 19 are amended herewith.

Support for the amendment to claim 1 for the binding material when the structure is a biocompatible coating can be found at paragraph [0024] as published; support for when the structure is an internal divider can be found at paragraph [0062] as published. Support for the structure as a pillar which is useful for affinity chromatography can be found at paragraph [0070] as published and the method of making the structure useful for affinity chromatograph (i.e., adding a binding material) is taught at paragraph [0024] as published.

The amendment to claim 9 to independent form clarifies the scope of the claim and is supported by claim 1, 6, 7, and 8. No new matter is added in these amendments. Support for the phrase “biocompatible material” in amended claim 9 is found in paragraph [0047].

Support for the amendments to claim 19 for the biocompatible nanoparticles where the structure is a coating can be found at paragraphs [0024] and [0048] as published; support for when the structure is an internal divider wall can be found at paragraph [0063] as published.

First Rejection under 35 U.S.C. § 112

Claims 1-4, 6, 7, and 17 are rejected as failing to comply with the written description requirement. The Examiner contends that the phrase “wherein the solidifiable fluid comprises a binding material” is new matter for these claims. Claim 1 has been amended herewith to recite that the structure comprises a coating, an internal divider wall, or a pillar. Thus, this rejection is overcome, and Applicants respectfully request that for the rejection to be withdrawn.

Second Rejection under 35 U.S.C. § 112

Claims 19, 22, 23, and 34 are rejected as failing to comply with the written description requirement. The Examiner contends that the phrase “wherein the solidifiable fluid comprises dissolvable nanoparticles” is new matter for these claims. Claim 19 has been amended to recite that the solidifiable fluid comprises biocompatible nanoparticles. Paragraph [0048] of the specification as published recites that biocompatible fillers, such as biocompatible nanoparticles, may be incorporated into the coating and paragraph [0063] recites that the divider wall may contain dissolvable nanoparticles such as silver colloids and salt crystals, which are similarly biocompatible.

Thus, claim 19 is supported by the application as filed and this rejection is overcome. Applicants respectfully request that for the rejection to be withdrawn.

Rejection under 35 U.S.C. § 102(e)

Claims 1-4, 6-10, 12-15, and 17 are rejected as anticipated by Beebe et al. The Examiner contends that Beebe teaches a process of making a structure as claimed, including a solidifiable fluid which contains a binding material. Applicants respectfully traverse.

The only structure as taught by Beebe containing a binding material is a device containing a hydrogel where the hydrogel responds to endocrine disrupting chemicals (EDC) such that it is in an expanded state when EDC is present and contracted when estradiol is conjugated to the estrogen receptor (ER) and no EDC ligands are present. Thus, the expansion and contraction of a hydrogel based on the presence or absence of an EDC ligand (or any similar ligand-biomolecule interaction) allows the Beebe device to detect biomolecules based on the hydrogel response (i.e., contraction or expansion) (see col. 28 line 36 – col. 28 line 63).

In contrast, claim 1 as presently amended is limited to a structure which is a coating, an internal divider wall, or a pillar, each of which are attached to the microfluidic channel. Similarly, claim 9 as presently amended is limited to a structure having a biocompatible anti-fouling coating attached to walls of the channel. Beebe teaches manufacture of a structural component (i.e., the

microfluidic chamber wall or channel), a functional component (i.e., a valve, a pump, or optoelectronic component, or a sensor) (see col. 2 line 59 – col. 3 line 1 and col. 8 line 67), and the formation of threads (col. 11 line 66 to col. 12 line 13). However, Beebe does not teach or suggest the formation of a coating, internal divider wall, or pillar which is attached to the microfluidic channel. (Note that Beebe discusses lipid and fatty acid coatings where the surface of the hydrogel is derivatized. However, this lipid layer is clearly distinct in both form and function compared to the structure which is a coating attached to a micro-fluidic device (col. 30 lines 27 – 65)).

The structure formed as described by Beebe containing a binding agent is useful as a port or iris which opens or closes as the hydrogel expands or contracts based on the presence or absence of a ligand (i.e., EDC) and is distinguished from the present invention in that the structured formed as recited in the present invention is a coating, divider wall, or pillar which is used, for example, for affinity chromatography. The coating, divider wall, or pillar of the presently claimed invention is not useful as a port or iris as described by Beebe.

Thus, since each and every limitation of the presently pending claim is not taught by Beebe and claims 1-4, 6-10, 12-15, and 17 are not anticipated by Beebe.

The present invention is further distinguished from Beebe in the claimed method of making the structure. There is nothing to teach or suggest to one of ordinary skill in the art, either in Beebe or as known by the ordinarily skilled person, that the formation of a responsive hydrogel as taught by Beebe should be modified so as to form a device comprising a static coating, internal divider wall, or pillar containing a binding material or an antifouling coating containing a biocompatible material.

Also, there is nothing to teach or suggest to one of ordinary skill in the art, either in Beebe or as known by the ordinarily skilled person, that the formation of threads, created by sheath flow within a microcapillary tube, should be modified to form a device comprising a coating, internal divider wall, or pillar attached to the microfluidic tube.

As previously discussed, there is no single structure of Beebe is made by both hydrodynamic focusing and lithography. Beebe teaches using laminar fluid flow and polymerization of a polymerizable mixture containing a ligand using lithography (see col. 5, lines 43-45). The use of hydrodynamic focusing is discussed only in the context of continuous manufacture of polymeric threads where lithography is not used. Hydrodynamic focusing is used only to form threads which are not structurally attached to a microfluidic channel and further, are not coatings, internal divider walls, or pillars.

The Examiner contends that the different embodiments of Beebe may be used individually or in combination. However, such a combination is only provided as a generalization and is insufficient to either anticipate or make the presently claimed invention obvious. Beebe discloses a broad range of devices where the components are formed in situ on or within the device. The specification provides for the formation of a broad class of different elements from polymerizable materials, solgels, etc., but does not provide how each distinct element in each method can be combined with other embodiments. A person of ordinary skill in the art would not, based on the teachings of Beebe and his own knowledge, know in what way the formation of a polymer thread and the formation of a hydrogel port could be modified to create the structures as claimed in the present invention. There is no teaching for this particular combination of elements and methods in Beebe or by design incentives in the marketplace.

Without some reason to combine the particular elements of the invention the formation of a structure such as a coating containing a binding agent where the coating is formed using hydrodynamic focusing as presently claimed, the obviousness rejection cannot be maintained. "Rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness" *KSR Int'l Co. v. Teleflex, Inc.*, 127 S. Ct. 1727, 1741 (2007) quoting from) *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006). The fact that multiple devices and methods are provided in Beebe is insufficient. The disparate teachings for forming structural and functional components by microfabrication within Beebe do not sufficiently teach the specific

elements, methods, and modifications required to obtain the present invention to make the present invention obvious.

Further, since Beebe does not anticipate claim 1, Beebe also does not anticipate dependant claims 2-4, 6-10, 12-15, and 17. Applicants respectfully request that this rejection be withdrawn.

Rejection under 35 U.S.C. § 103

Claims 19, 22-25, and 34 are rejected as obvious in view of Beebe et al. and further in view of Schneider et al. The Examiner contends that Schneider teaches a process of making a structure including the use of a solidifiable fluid containing nanoparticles, and it thus would have been obvious to combine the process of Beebe and Schneider. Applicants respectfully traverse.

Schneider teaches the synthesis of polymer fibers (see paragraph [0054]) and Beebe teaches the synthesis of polymer threads (col. 11 line 66 to col. 12 line 13). However, a person of ordinary skill in the art would not be motivated to combine the flow reactor as described by Schneider and the thread-production of Beebe and modify them in such a way to form the coating or internal divider wall as claimed in the present invention.

Further, the nanoparticles as disclosed in Schneider bear an oxide coating or surface hydroxyl groups which is polymerized using silane chemistry or other surface attachment chemistry to introduce surface functional groups to allow for specific polymerization (see paragraph [0049]). Thus, Schneider teaches the use of silane monomers, defined as nanoparticles, which are polymerized in a microfluidic flow reactor to form polymer fibers. These coated nanoparticles are taught to exhibit a variety of useful properties: increased yield stress and microhardness, improved ductability and malleability, and plastic deformability (see paragraph [0037]). In contrast, the nanoparticles of the present invention are biocompatible fillers which may be incorporated into the coating in order to increase biocompatibility of the coating and, alternatively, may be dissolvable and thus used to tailor the porosity or permeability of the divider wall structure (see paragraphs [0048] and [0063]). Thus, the nanoparticles taught by Schneider are incorporated into an entirely different structure for an entirely different purpose.

11